

Assessment of accidental nutrient spills from ships into the Singapore marine environment

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Singapore is home to the world's largest transshipment hub port, with connections to more than 600 ports in 123 countries. It lies at the crossroads between the Indian and Pacific Oceans. The sea is a national resource on which Singapore's well being depends to a large extent. Over 20,000 vessels from more than 200 lines called at Singapore's four terminals in 2003, generating a record 18.1 million TEUs. This includes daily sailings to every major port in the world. In 2002, more than 142,000 vessels totalling 972 million GT called at the Port of Singapore; making it the world's busiest in terms of shipping tonnage. The ships may carry hazardous materials and substances, including chemicals and fertilisers. As at any busy shipping route in the world, probability of accidents is small, but can't be neglected completely. Therefore, it is important to study consequences of accidental spills of different substances, arising from ship groundings, collisions and sinking events. Some of the organic and inorganic pollutants can have acute and long-term impacts on the marine environment. Even though seawater has assimilation capacity, the combined effect of extra pollutant and nutrient load may cause outbreak of harmful algal bloom, eutrophication and loss of natural habitat.

A case study has been conducted to understand the dynamics of nutrients, and to assess the impact of accidental nutrient spills in different areas of Singapore Strait. These are analyzed for typical hydrodynamic scenarios [1]. Utilized NEUTRO model [2] has the proficient US EPA WASP kinetics combined with the 3-D advection-diffusion module to improve the spatial and temporal resolution. Most vulnerable zones are being identified using Monte-Carlo technique.

Keywords: Singapore seawater; forecast; 3-D dynamics, numerical model, water quality, human impact, nutrient spills, marine environment.

References

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